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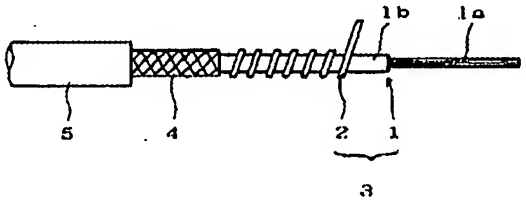
(54)【発明の名称】　コード状温度ヒューズと面状温度ヒューズ

(57)【要約】

【目的】　本発明の目的は、導電体細線の線径に関わらず良好な断線時間を有するコード状温度ヒューズと、同様な特徴を有する面状温度ヒューズを提供することにある。

【構成】　外径約１ｍｍのガラスコードにシリコーンワニス処理を施してなる抗張力体１ａの周囲に、弾性材料１ｂとして１．４ｍｍ×１．４ｍｍの略四角形断面のシリコーンゴムを押出被覆し、弾性芯１を製造する。この弾性芯１の角に０．２ｍｍφの共晶半田線からなる導電体細線２を充分食い込ませて１５回／１０ｍｍ横巻し、中心材３を形成する。中心材３にはロジン樹脂系フラックスをディップ塗布してフラックス加工処理を施す。その後、繊維径約９ミクロンの無アルカリガラス糸を撚り合せて約７０番手とした繊維束を、１６打の製紐機で編組密度約１７／２５ｍｍで編組し空間層４（編組層）を形成する。最後に、シリコーンゴムを肉厚０．５ｍｍで水冷しながら押出被覆し、直ちに熱風加硫を施して絶縁被覆５を形成してコード状温度ヒューズとする。



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【特許請求の範囲】

【請求項１】　長手方向に連続した弾性芯と該弾性芯上に巻回された所定の温度で溶融する導電体細線とからなる中心材と、その直上に形成された空間層と、絶縁被覆からなるコード状温度ヒューズにおいて、上記導電体細線が、フラックスにより加工処理されていることを特徴とするコード状温度ヒューズ。

【請求項２】　平面上に蛇行状態に配設された請求項１記載のコード状温度ヒューズと、上記コード状温度ヒューズの配設状態を固定する手段とからなることを特徴とする面状温度ヒューズ。

【発明の詳細な説明】

【０００１】

【産業上の利用分野】本発明は、異常な高温に一部分でも晒されることにより断線し、検知することができるコード状の温度ヒューズと面状の温度ヒューズに関する。

【０００２】

【従来の技術】従来から異常な高温を検知するために、安全装置として温度ヒューズが使用されてきた。しかし、異常な温度になる可能性のある場所が比較的大きな領域で存在する場合には、温度ヒューズを複数個使用し、例えば図５に示すようなアッセンブリを組んでいた。図中、符号１０は温度ヒューズであり、リード線１２と接続子１１によって接続されている。これらは、保護チューブ１３によって機械的に保護されている。

【０００３】

【発明が解決しようとする課題】しかしながら上記のように構成された従来の温度ヒューズアッセンブリは、異常温度を検知する部分が点であり局部的に発生する温度異常に確実に作用するか定かではない。また、温度ヒューズを複数使用することは作業性及びコストを著しく損なう。異常温度の確実な検知、良好な作業性及びコストを達成するために、コード状の温度ヒューズが望まれていた。そこで、当該出願人は特願平３－３３３９２１号において、長手方向に連続した弾性芯と該弾性芯上に巻回された所定の温度で溶融する導電体細線とからなる中心材と、その直上に形成された空間層と、絶縁被覆からなるコード状温度ヒューズを提案している。コード状温度ヒューズは、電気回路の増加に伴い電流容量を大きく場合がある。許容電流を大きくするためは温度検知部である導電体細線を太くする必要があるが、導電体細線を太くすると溶断するまでの時間（以下、断線時間という）が長くなる場合がある。

【０００４】本発明はこのような点に基づいてなされたものでその目的とするところは、導電体細線の線径に関わらず良好な断線時間を有するコード状温度ヒューズと、同様な特徴を有する面状温度ヒューズを提供することにある。

【０００５】

【課題を解決するための手段】上記目的を達成するべく

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本発明によるコード状温度ヒューズは、長手方向に連続した弾性芯と該弾性芯上に巻回された所定の温度で溶融する導電体細線とからなる中心材と、その直上に形成された空間層と、絶縁被覆からなるコード状温度ヒューズにおいて、上記導電体細線が、フラックスにより加工処理されていることを特徴とするものである。更に、上記のコード状温度ヒューズを平面上に蛇行状態に配設し、この配設状態を固定する手段を用いて面状温度ヒューズとすることも考えられる。

【０００６】弾性芯は、中心の抗張力体の周りに弾性材料が被覆された構造である。抗張力体としてはガラス繊維，アルミナ繊維等の無機繊維、ポリエチレンテレフタレート繊維，芳香族ポリエステル繊維，脂肪族ポリアミド繊維，芳香族ポリアミド繊維等の有機繊維、ステンレス鋼繊維等の金属繊維が用いられる。これらの周りに被覆される弾性材料としては、一般的なエラストマー材料であれば何でも良い。

【０００７】弾性芯の断面形状は特に制限はされないが、好ましくは放射方向に複数の凸部を有する断面形状である。これには通常の多角形のほか、星型のような形状も含まれる。また、星型、多角形は、一般的にはっきりした角を持つ形状であるが、ここでは角が丸くつぶれた形状であっても良い。これらは円形断面の場合に比べて導電体細線が弾性芯に食い込み易く、導電体細線が溶融した時により速やかに切れるため好ましい。断面形状として多角形とした場合、導電体細線の食い込み易さから６角形以下が好ましく選ばれる。

【０００８】導電体細線としては低融点合金及び半田からなる群より選ばれた金属細線が用いられる。低融点合金及び半田としては、例えば化学便覧基礎編（丸善刊、改訂３版、１９８４年刊）Ｉ－５０９ページに例が示されている中の、融点が３００℃以下のものである。導電体細線の線径としては、一般的な横巻機械によって弾性芯に巻回し可能な０．０４ｍｍφ以上０．８ｍｍφ以下程度が好ましい。また、この導電体細線は、フラックスによって加工処理されたものを用いる。フラックス加工未処理のものに比べ断線時間を短縮させることができる。加工処理は、導電体細線の中央部にフラックスを入れたものでも、導電体細線表面をフラックスでディップ処理したものでも良い。フラックスは、一般的に用いられるロジン樹脂系フラックスで良く、少量の活性剤を含有したものでも良い。上記導電体細線を弾性体に少なくとも導電体細線がずれない程度のテンションで巻回して、中心材とする。導電体細線が巻回されるピッチとしては、線径の１．５倍以上が好ましく、更に好ましくは２倍以上１５倍以下である。また何本かの導電体細線を引き揃えるか、または撚り合わせたものを巻回す集合横巻を行っても良い。

【０００９】空間層は、中心材が弾性芯の断面積、横巻条件などを調節することによって多角形に近い形状とな

っている場合は、単に絶縁層を、当業者間で公知のいわゆるチューピングの手法で同心円状に密着させずに押し出せば形成される。その他の方法として空間層は、繊維束を疎に編組することにより形成される。好ましくは、同回転方向の繊維束の間隔が該繊維束の幅の０．５倍以上８倍以下になるように調整される。また、繊維束を疎に横巻することによって形成され、好ましくは繊維束を該繊維束の幅の０．３倍以上５倍以下の間隔を開けて横巻することにより形成される。ここで疎な編組または横巻とは繊維間にある程度の空間を残した編組または横巻をいう。編組、横巻いずれの場合も、繊維束の間隔が上記の好ましい範囲の下限よりも狭いと空間の量が充分でなくなり、溶融した導電体細線が心材の周りにあるため、チャタリングを起こし再接触の危険があり好ましくなく、また上記の上限よりも大きいと絶縁被覆材が間に入り込みかえって空間の量を少なくしてしまうため好ましくない。繊維の種類としては、上記弾性芯の抗張力体で例示した無機繊維または有機繊維が用いられるが、好ましくは難燃性の芳香族ポリエステル繊維、芳香族ポリアミド繊維、ポリフェニレンサルファイド繊維、不燃性のガラス繊維、アルミナ繊維などが用いられる。もちろん編組や横巻は、２重、３重以上施しても良い。

【００１０】絶縁被覆は、温度ヒューズが使用される雰囲気温度や導電体細線の溶融温度に応じて任意に選択すれば良いが、絶縁被覆を被覆する際に導電体細線が溶融しないようにする必要がある。そのような絶縁被覆としては、例えば比較的低温で加工できるエチレン系共重合体などの熱可塑性ポリマーを電子線架橋、シラン架橋などの低温でできる架橋法で架橋して形成するか、常温付近で押出加工でき、比較的低温で架橋できるシリコーンゴムを使用して形成する。また、編組を絶縁ワニスで目どめしたものを絶縁材料としても良い。特にシリコーンゴムを用いた場合は、絶縁被覆の機械強度を高めるため、外装に編組を施しても良い。上記は連続的に絶縁被覆する方法の例であるが、長尺でなくても良い場合は、収縮性絶縁チューブを含む絶縁チューブを単にかぶせることで代用することもできる。絶縁被覆の厚さは、電気絶縁性，機械的強度等の必要特性が満たされるものであれば、薄肉である方が感度が増し好ましい。

【００１１】これらのコード状温度ヒューズを任意の蛇行状態に配設し、この配設状態を固定する手段を用いて面状温度ヒューズが製造できる。固定する手段としては、基板または基布に縫いつける方法や接着剤を用いて固定する方法などが挙げられるが、好ましくは特公昭６２－４４３９４号公報または特公昭６２－６２０３２号公報に挙げられた手段を用いる。これらには、それぞれ金属箔上に両面接着紙によって固定する方法、接着剤を塗布した金属板または金属箔に熱融着する方法について記述されている。

【００１２】

【作用】本発明によれば、許容電流を大きくとるために導電体細線を太くしても、熱に対して良好な断線時間を得ることができる。

【００１３】

【実施例】以下に実施例を示し本発明の内容を更に詳細に説明するが、本発明はこの実施例によって制限されるものではない。

【００１４】《実施例１》実施例１としては、図１に示すコード状温度ヒューズを製造した。外径約１ｍｍのガラスコードにシリコーンワニス処理を施してなる抗張力体１ａの周囲に、弾性材料１ｂとして１．４ｍｍ×１．４ｍｍの略四角形断面のシリコーンゴムを押出被覆し、図２に示すような弾性芯１を製造した。この弾性芯１の角に、０．２ｍｍφの共晶半田線（融点１８３℃）からなる導電体細線２を充分食い込ませて１５回／１０ｍｍ横巻（線径の３．３倍のピッチ）した。横巻を終えた中心材３は食い込みにより変形し円形断面に近い形になっていた。次に中心材３にロジン樹脂系フラックスをディップ塗布して導電体細線をフラックス加工処理した。その後、繊維径約９ミクロンの無アルカリガラス糸を撚り合わせて約７０番手とした繊維束を、１６打の製紐機で編組密度約１７／２５ｍｍで編組し空間層４（編組層）を形成した。この場合、繊維束の幅は約０．５ｍｍであり、繊維束の間隔は約１ｍｍ（繊維束の幅の約２倍）である。最後に、絶縁被覆５としてシリコーンゴムを肉厚０．５ｍｍで水冷しながら押し出し、直ちに熱風加硫を施した。熱風加硫に際しては、熱風炉の出口付近の温度を１７０℃以下とした。

【００１５】このようにして製造されたコード状温度ヒューズ約１５ｃｍを、内径４．０ｍｍ、長さ約１５ｃｍのガラス繊維編組チューブに挿入し１００Ｖ交流電源から外部負荷を調整し、０．１Ａ程度の電流を流しながら中央部分に約２５０℃の熱風を当てて導電体細線が断線するまでの時間を測定した。外部負荷には白熱電球を用い、導電体細線が断線する際の該導電体細線の溶断し易さの状態を白熱電球の点滅の有無で調べた。これを５回繰り返した。また、断線したコード状温度ヒューズの両端の導電体細線に５００Ｖ絶縁計を接続し、断線部を屈曲させ該断線部のチャタリングの有無、すなわち再接触を起こす可能性の有無及び絶縁抵抗を調べた。試験結果は表１に示した。

【００１６】《実施例２》実施例２としては、コード状温度ヒューズを以下のように製造した。外径約１ｍｍのガラスコードにシリコーンワニス処理を施してなる抗張力体１ａの周囲に、弾性材料１ｂとして内接円１．５ｍｍ外接円２．３ｍｍの放射状星型断面のシリコーンゴムを押出被覆し、図３に示したような弾性芯１を製造した。この弾性芯１の突起に、０．５ｍｍφの共晶半田線からなる導電体細線２を充分食い込ませて５回／１０ｍｍ横巻（線径の４倍のピッチ）した。横巻を終えた中心

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材3は食い込みにより変形し円形断面に近い形になっていた。次に中心材3にロジン樹脂系フラックスをディップ塗布して導電体細線をフラックス加工処理した。空間層4、絶縁被覆5は、実施例1と同様に製造した。電流値を0．5Aとした以外は実施例1と同様に試験を行い、結果を表1に併記した。

【0017】《実施例3》実施例3としては、導電体細線として中央部にフラックスを入れた0．5mmφの共晶半田線を使用した以外は実施例2と同様にコード状温度ヒューズを製造した。尚、中心材へのフラックスのディップ塗布は行わなかった。実施例2と同様な試験を行い、結果を表1に併記した。

【0018】《実施例4》実施例4としては、導電体細線として0．6mmφの共晶半田線を使用した以外は実施例2と同様にコード状温度ヒューズを製造した。尚、＊導電体細線の横巻きピッチは、線径の3．3倍となる。実施例2と同様な試験を行い、結果を表1に併記した。

【0019】《実施例5》実施例5としては、導電体細線として中央部にフラックスを入れた0．6mmφの共晶半田線を使用した以外は実施例2と同様にコード状温度ヒューズを製造した。導電体細線の横巻きピッチは、線径の3．3倍である。尚、中心材へのフラックスのディップ塗布は行わなかった。実施例2と同様な試験を行い、結果を表1に併記した。

【0020】《比較例》比較例としては、導電体細線を横巻きした後の中心材にフラックス加工処理しない以外は実施例2と同様にコード状温度ヒューズを製造した。実施例2と同様な試験を行い、結果を表1に併記した。

【0021】

【表1】

	実施例1	実施例2	実施例3	実施例4	実施例5	比較例
導電体細線（半田線）の線径 (mm)	0．2	0．5	0．5	0．6	0．6	0．6
フラックス処理加工の有無	有	有	有	有	有	無
平均断線時間 (秒)	38	61	58	67	64	90
断線時間のバラツキ (秒)	10	12	11	13	12	45
白熱電球の点滅の有無	無	無	無	無	無	1本有
再接触の有無	無	無	無	無	無	無
断線後の絶縁抵抗 (MΩ)	10以上	10以上	10以上	10以上	10以上	10以上

【0022】表1の試験結果を見ると、本実施例のコード状温度ヒューズは、比較例に比べて平均断線時間及び断線時間のバラツキがともに小さく、良好であり、また導電体細線が断線する際の状態も白熱電球の点滅を起こすことなく一度に完全に断線しており、フラックス加工処理の効果が立証されている。

【0023】《実施例6》実施例6としては、実施例2で製造したコード状温度ヒューズを蛇行状態に配設し、図4に示すような面状温度ヒューズを特公昭62－44394号公報に示された方法で製造した。図中の符号8は、片面に離形紙9を有する両面粘着紙であり、符号6は前記両面粘着紙8の上面に蛇行状態に配設されたコード状温度ヒューズである。更に、符号7は前記コード状温度ヒューズ6の全体を覆う金属箔であり、この金属箔7は前記両面粘着紙8と接着固定されている。本実施例においては、両面粘着紙としてアクリル系粘着紙を用い、金属箔としては、厚さ100マイクロメーターのアルミニウム箔を用いた。本実施例では、特公昭62－4※4394号公報に準じて行ったので金属箔及び両面粘着紙を用いたが、この公報に準じない方法で製造しても良く、またこの公報の製造方法において、他の材料、例えば金属箔の代わりにプラスチックフィルムを使用しても良い。

【0024】このようにして製造された面状温度ヒューズを厚さ0．5mmの鉄製のパネルに張り付け、パネルを垂直に立てた。パネルの裏側には市販の壁紙を張り付けた。この状態で、面状温度ヒューズに0．5Aの電流を流しながらバーナーの外炎が触れる程度まで近づけ、温度ヒューズの導電体細線が断線するまでこの状態を保った。その後、面状温度ヒューズは熱を検知し断線した。断線後のパネルの裏側の壁紙には、炭化等の変化も見られず、温度ヒューズが有効に機能したことがわかった。

【0025】

【発明の効果】以上詳述したように本発明によれば、圧縮力がかからないところでも、異常高温によって確実に

断線し、しかも断線後にも溶融した導電体などによって再接触を起こさず、誤動作を招かないコード状温度ヒューズと、同様な特徴を有する面状温度ヒューズを得ることができる。これらの温度ヒューズは、電流容量を大きくとることができ、しかも比較的安価であるため各種熱機器の安全装置として利用でき、信頼度の向上やコストの削減効果など有用なものである。

【図面の簡単な説明】

【図1】本発明の実施例1として製造したコード状温度ヒューズの一部切欠側面図である。

【図2】本発明の実施例1として製造したコード状温度ヒューズにおける弾性芯の断面図である。

【図3】本発明の実施例2として製造したコード状温度ヒューズにおける弾性芯の断面図である。

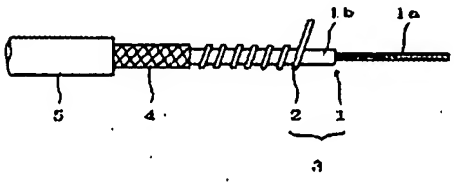
【図4】本発明の実施例6として製造した面状温度ヒューズの一部切欠斜視図である。

【図5】従来例の温度ヒューズのアッセンブリ状態を示す一部切欠斜視図である。

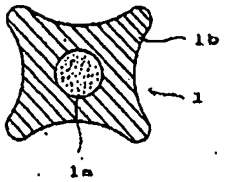
【符号の説明】

1　弾性芯
1a　抗張力体（弾性芯抗張力体）
1b　弾性材料
2　導電体細線
3　中心材
4　空間層（編組層）
5　絶縁被覆
6　コード状温度ヒューズ
7　金属箔
8　両面粘着紙
9　離形紙
10　温度ヒューズ
11　接続子
12　リード線
13　保護チューブ

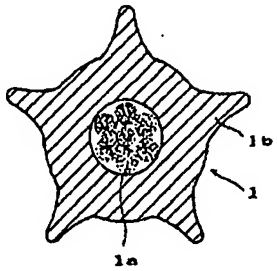
【図1】



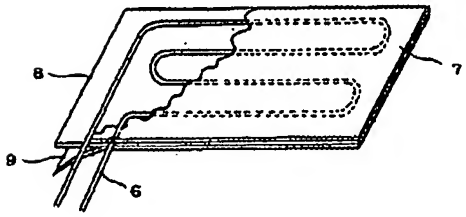
【図2】



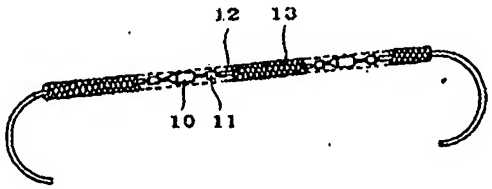
【図3】



【図4】



【図5】



PATENT ABSTRACTS OF JAPAN

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(71)Applicant : KURABE IND CO LTD

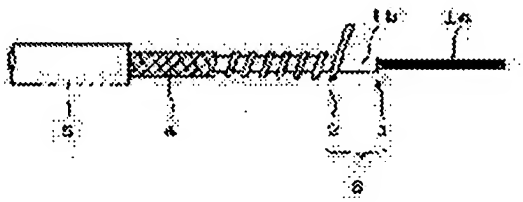
(72)Inventor : HASE YASUHIRO

(54) CORD-LIKE TEMPERATURE FUSE AND SHEET-LIKE TEMPERATURE FUSE

(57)Abstract:

PURPOSE: To provide a cord-like temperature fuse which excels in a breaking time independently of the wire diameter of a conductor fine wire and also to provide a sheet-like fuse having the same feature.

CONSTITUTION: A silicone rubber having a nearly square cross section of 1.4mm×1.4mm is extruded as an elastic material 1b to cover the periphery of a tensile strength material 1a constituted by applying a silicone varnish treatment to a glass cord having an outer diameter of about 1mm to manufacture an elastic core 1. A conductor fine wire 2 made of an eutectic solder wire of 0.2mmϕ is so wound at a pitch of 15 turns per 10mm as to bite into the corner of the elastic core 1 to form a central material 3. Rosin resin flux is applied by dipping to the central material 3 for a flux working treatment. After that, No-alkaline glass fiber of about 9 micron in fiber diameter is twisted to make a fiber bundle of about 70 count and further the fiber bundle is braided is at the braiding density of about 17 per 25mm with a braider of 16 count to form a spacing layer 4 (braid layer). Finally, a silicone rubber with the thickness of 0.5mm is extruded for covering with water cooling being performed and then immediately hot air vulcanization is applied thereto to form an insulation cover, thereby providing a cord-like temperature fuse.



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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] By exposing a part to an unusual elevated temperature, this invention is disconnected and relates to a detectable code-like thermal fuse and a detectable field-like thermal fuse.
[0002]
[Description of the Prior Art] In order to detect an unusual elevated temperature from the former, the thermal fuse has been used as a safety device. However, when the location which may become unusual temperature existed in a comparatively big field, the assembly as used two or more thermal fuses, for example, shown in drawing 5 was constructed. Among drawing, a sign 10 is a thermal fuse and is being connected to lead wire 12 by the connection child 11. These are mechanically protected by the protective tubing 13.
[0003]
[Problem(s) to be Solved by the Invention] However, the conventional thermal fuse assembly constituted as mentioned above does not have the certain part which detects abnormal temperature in whether it acts on the abnormalities in temperature which are points and are caused locally certainly. Moreover, using two or more thermal fuses spoils workability and cost remarkably. In order to attain positive detection, the good workability, and cost of abnormal temperature, a code-like thermal fuse was desired. Then, the applicant concerned has proposed the code-like thermal fuse which serves as main material which consists of a conductor thin line fused at the predetermined temperature wound on the elastic heart which followed the longitudinal direction, and this elastic heart, and a space layer formed in right above [of it] from pre-insulation in Japanese Patent Application No. No. 333921 [three to]. A code-like thermal fuse has a case greatly in current capacity with the increment in an electrical circuit. Although it is necessary to make thick the conductor thin line which is the temperature detection section in order to enlarge the allowable current, time amount (henceforth open-circuit time amount) if a conductor thin line is made thick, until it will melt may become long.
[0004] This invention has the place which it was made based on such a point and made into the object in offering the code-like thermal fuse which is not concerned with the wire size of a conductor thin line, but has good open-circuit time amount, and the field-like thermal fuse which has the same description.
[0005]
[Means for Solving the Problem] The code-like thermal fuse by this invention is characterized by for processing processing of the above-mentioned conductor thin line to be carried out by flux in the code-like thermal fuse which serves as main material which consists of a conductor thin line fused at the predetermined temperature wound on the elastic heart which followed the longitudinal direction, and this elastic heart, and a space layer formed in right above [of it] from pre-insulation in order the above-mentioned object. Furthermore, the above-mentioned code-like thermal fuse is arranged on a flat surface at a meandering condition, and considering as a field-like thermal fuse using a means to fix this arrangement condition is also considered.
[0006] The elastic heart is the structure with which the spring material was covered around the main

tensile strength object. As a tensile strength object, metal fibers, such as organic fiber, such as inorganic fibers, such as a glass fiber and an alumina fiber, a polyethylene terephthalate fiber, aromatic polyester fiber, an aliphatic series polyamide fiber, and aromatic polyamide fiber, and stainless steel fiber, are used. If it is a common elastomeric material as a spring material covered around these, it is good anything.

[0007] The cross-section configuration of the elastic heart is a cross-section configuration which has the desirable heights of plurality [direction / radiation], although especially a limit is not carried out. A configuration like a star type besides the usual polygon is also included in this. Moreover, although a star type and a polygon are configurations with the angle which generally clarified, they may be the configuration where the angle was crushed round here. These are desirable in order to go out promptly by the time of a conductor thin line tending to eat into the elastic heart compared with the case of a circular cross section, and a conductor thin line fusing. When it considers as a polygon as a cross-section configuration, six or less square shapes are preferably chosen from the interlocking easy of a conductor thin line.

[0008] The metal thin line chosen from the group which consists of low melting alloys and solder as a conductor thin line is used. As low melting alloys and solder, the melting point of the inside where the example is shown, for example in I-509 pages (******, the 3rd edition of revision, 1984 annual publications) of chemistry handbook basic volumes is a thing 300 degrees C or less. As a wire size of a conductor thin line, below 0.8mmphi extent is desirable by the common horizontal volume machine more than 0.04mmphi in which winding is possible to the elastic heart. Moreover, that in which processing processing was carried out by flux is used for this conductor thin line. Open-circuit time amount can be shortened compared with flux processing a non-processed thing. That to which what put flux into the center section of the conductor thin line carried out DIP processing of the conductor thin line front face by flux may be used for processing processing. The rosin resin system flux generally used is sufficient as flux, and the thing containing a little activator is sufficient as it. The above-mentioned conductor thin line is wound around an elastic body by the tension which is extent from which a conductor thin line does not shift at least, and it considers as main material. As a pitch around which a conductor thin line is wound, 1.5 or more times of a wire size are 15 or less twice [more than] as many times as this desirable still more preferably. Moreover, a winding ****** horizontal volume may be performed for what draws and arranges how many of that conductor thin line, or was twisted.

[0009] When main material adjusts the cross section of the elastic heart, a horizontal wound strip affair, etc. and it is a configuration near a polygon, a space layer will be formed if an insulating layer is only extruded, without making it stick to concentric circular by the so-called technique of well-known tubing among these contractors. A space layer is formed by carrying out the braid of the fiber bundle to a non-dense as the other approaches. Preferably, it is adjusted so that spacing of the fiber bundle of this hand of cut may become 8 or less times of the width of face of this fiber bundle 0.5 or more times. Moreover, it is formed by carrying out the horizontal volume of the fiber bundle to a non-dense, and is formed by opening spacing with a times [5 or less times of the width of face of this fiber bundle] of 0.3 or more times, and carrying out the horizontal volume of the fiber bundle preferably. A **** braid or a horizontal volume means between fiber the braid or horizontal volume which left a certain amount of space here. a braid and a horizontal volume -- if larger [since the conductor thin line which the amount of space becomes less enough and fused is in the surroundings of a core when spacing of a fiber bundle is narrower than the minimum of the above-mentioned desirable range, there is risk of lifting re-contact about a chattering, and] than the above-mentioned upper limit which is not desirable, neither of the cases is desirable in order for pre-insulation material to enter in between and to lessen the amount of space on the contrary. Although the inorganic fiber or the organic fiber illustrated with the tensile strength object of the above-mentioned elastic heart is used as a class of fiber, desirable fire-resistant aromatic polyester fiber, aromatic polyamide fiber, polyphenylene sulfide fiber, a noncombustible glass fiber, an alumina fiber, etc. are used. of course -- a braid and a horizontal volume -- a duplex -- three-fold or more may be given.

[0010] In case pre-insulation covers pre-insulation, it is necessary to make it a conductor thin line not

fuse it, although what is necessary is just to choose it as arbitration according to the ambient temperature for which a thermal fuse is used, or the melting temperature of a conductor thin line. As such pre-insulation, a bridge is constructed, and thermoplastic polymers, such as an ethylene system copolymer comparatively processible at low temperature, for example, are formed with the cross-linking method which can be done at low temperature, such as electron ray bridge formation and silane bridge formation, or it forms using the silicone rubber which can carry out extrusion near ordinary temperature and can construct a bridge at low temperature comparatively. Moreover, it is good also considering what carried out [****] of the braid with the insulating varnish as an insulating material. A braid may be given to sheathing in order to raise the mechanical strength of pre-insulation, when especially silicone rubber is used. Although the above is the example of the approach of carrying out pre-insulation continuously, when you may not be a long picture, it can also substitute only putting the insulating tube containing a contractile insulating tube for it. The thickness of pre-insulation increases [sensibility] and has the desirable direction which is thin meat, if need properties, such as electric insulation and a mechanical strength, are fulfilled.

[0011] These code-like thermal fuses are arranged in the meandering condition of arbitration, and a field-like thermal fuse can be manufactured using a means to fix this arrangement condition. Although the approach of sewing to a substrate or a base fabric, the approach of fixing using adhesives, etc. are mentioned as a means to fix, the means preferably mentioned to JP,62-44394,B or JP,62-62032,B is used. How to carry out thermal melting arrival to the metal plate or metallic foil which applied the approach of fixing in double-sided adhesion paper on a metallic foil, respectively and adhesives is described by these.

[0012]

[Function] According to this invention, in order to take the large allowable current, even if it makes a conductor thin line thick, good open-circuit time amount can be acquired to heat.

[0013]

[Example] This invention is not restricted by this example, although an example is shown below and the content of this invention is further explained to a detail.

[0014] <<example 1>> As an example 1, the code-like thermal fuse shown in drawing 1 was manufactured. Around tensile strength object 1a which comes to give silicone varnish treated to a glass cord with an outer diameter of about 1mm, the extrusion coat of the silicone rubber of a 1.4mmx1.4mm abbreviation square cross section was carried out as spring material 1b, and the elastic heart 1 as shown at drawing 2 was manufactured. The conductor thin line 2 which consists of an eutectic solder line (melting point of 183 degrees C) of 0.2mmphi was made to eat into the angle of this elastic heart 1 enough, and carried out 15 times / 10mm horizontal volume (one 3.3 times the pitch of a wire size) to it. The main material 3 which finished the horizontal volume deformed with interlocking, and had become a form near a circular cross section. Next, DIP spreading of the rosin resin system flux was carried out at the main material 3, and flux processing processing of the conductor thin line was carried out. Then, the braid of the fiber bundle which twisted no-alkali glass yarn of 9 micron of fiber ****, and was made into No. 70 [about] was carried out by the braid consistency 17 [about] / 25mm with the **** machine of 16 **, and the space layer 4 (braid layer) was formed. In this case, the width of face of a fiber bundle is about 0.5mm, and spacing of a fiber bundle is about 1mm (twice [about] of the width of face of a fiber bundle). It extruded at the last, carrying out water cooling of the silicone rubber with the thickness of 0.5mm as pre-insulation 5, and hot blast vulcanization was promptly given to it. On the occasion of hot blast vulcanization, temperature near the outlet of an air-heating furnace was made into 170 degrees C or less.

[0015] Thus, about 15cm of manufactured code-like thermal fuses was inserted in the glass fiber braid tube with a bore [of 4.0mm], and a die length of about 15cm, the external load was adjusted from 100V AC power supply, and time amount until it applies about 250-degree C hot blast to a part for a center section with a sink and a conductor thin line disconnects an about [0.1A] current was measured. For the external load, the condition of the ease of melting of this conductor thin line at the time of a conductor thin line being disconnected was investigated by the existence of a flash of an incandescent lamp using

the incandescent lamp. This was repeated 5 times. Moreover, 500V insulation resistance tester was connected to the conductor thin line of the ends of the disconnected code-like thermal fuse, the open-circuit section was made crooked and the existence of the chattering of this open-circuit section, i.e., the existence of possibility of causing re-contact, and insulation resistance were investigated. The test result was shown in a table 1.

[0016] <<example 2>> As an example 2, the code-like thermal fuse was manufactured as follows. Around tensile strength object 1a which comes to give silicone varnish treated to a glass cord with an outer diameter of about 1mm, the extrusion coat of the silicone rubber of the radial star type cross section of 2.3mm of 1.5mm circumscribed circles of inscribed circles was carried out as spring material 1b, and the elastic heart 1 as shown at drawing 3 was manufactured. The conductor thin line 2 which consists of an eutectic solder line of 0.5mmphi was made to eat into the projection of this elastic heart 1 enough, and carried out 5 times / 10mm horizontal volume (one 4 times the pitch of a wire size) to it. The main material 3 which finished the horizontal volume deformed with interlocking, and had become a form near a circular cross section. Next, DIP spreading of the rosin resin system flux was carried out at the main material 3, and flux processing processing of the conductor thin line was carried out. The space layer 4 and pre-insulation 5 were manufactured like the example 1. Except having set the current value to 0.5A, it examined like the example 1 and the result was written together to a table 1.

[0017] <<example 3>> The code-like thermal fuse was manufactured like the example 2 except having used the eutectic solder line of 0.5mmphi which put flux into the center section as a conductor thin line as an example 3. In addition, DIP spreading of the flux to main material was not performed. The same trial as an example 2 was performed, and the result was written together to a table 1.

[0018] <<example 4>> As an example 4, the code-like thermal fuse was manufactured like the example 2 except having used the eutectic solder line of 0.6mmphi as a conductor thin line. In addition, the horizontal volume pitch of a conductor thin line will be 3.3 times the wire size. The same trial as an example 2 was performed, and the result was written together to a table 1.

[0019] <<example 5>> The code-like thermal fuse was manufactured like the example 2 except having used the eutectic solder line of 0.6mmphi which put flux into the center section as a conductor thin line as an example 5. The horizontal volume pitch of a conductor thin line is 3.3 times the wire size. In addition, DIP spreading of the flux to main material was not performed. The same trial as an example 2 was performed, and the result was written together to a table 1.

[0020] Example of <<comparison>> As an example of a comparison, the code-like thermal fuse was manufactured like the example 2 except not carrying out flux processing processing to the main material after carrying out the horizontal volume of the conductor thin line. The same trial as an example 2 was performed, and the result was written together to a table 1.

[0021]

[A table 1]

	実施例1	実施例2	実施例3	実施例4	実施例5	比較例
導電体細線（半田線）の線径 (mm)	0．2	0．5	0．5	0．6	0．6	0．6
フラックス処理加工の有無	有	有	有	有	有	無
平均断線時間 (秒)	38	61	58	67	64	90
断線時間のバラツキ (秒)	10	12	11	13	12	45
白熱電球の点滅の有無	無	無	無	無	無	1本有
再接触の有無	無	無	無	無	無	無
断線後の絶縁抵抗 (MΩ)	10以上	10以上	10以上	10以上	10以上	10以上

[0022] If the test result of a table 1 is seen, both the code-like thermal fuses of this example have the small variation in average open-circuit time amount and open-circuit time amount compared with the example of a comparison, and it is good, and it has disconnected thoroughly at once, without the condition at the time of a conductor thin line being disconnected also causing the flash of an incandescent lamp, and the effectiveness of flux processing processing is proved.
[0023] <<example 6>> As an example 6, the code-like thermal fuse manufactured in the example 2 was arranged in the meandering condition, and the field-like thermal fuse as shown in drawing 4 was manufactured by the approach shown in JP,62-44394,B. The sign 8 in drawing is a double-sided gummed paper which has mold-releasing paper 9 on one side, and a sign 6 is the code-like thermal fuse arranged in the top face of said double-sided gummed paper 8 by the meandering condition. Furthermore, a sign 7 is a wrap metallic foil about said whole code-like thermal fuse 6, and adhesion immobilization of this metallic foil 7 is carried out with said double-sided gummed paper 8. In this example, aluminium foil with a thickness of 100 micrometers was used as a metallic foil, using an acrylic gummed paper as a double-sided gummed paper. Although the metallic foil and the double-sided gummed paper were used in this example since it carried out according to JP,62-44394,B, you may manufacture by the approach according to this official report, and a plastic film may be used instead of other ingredients, for example, a metallic foil, in the manufacture approach of this official report.
[0024] Thus, the manufactured field-like thermal fuse was stuck on the iron panel with a thickness of 0.5mm, and the panel was stood vertically. Commercial wallpaper was stuck on the background of a panel. This condition was maintained until it brought close to a field-like thermal fuse to extent which the outer flame of a burner touches with the current of 0.5A with a sink and the conductor thin line of a thermal fuse was disconnected in this condition. Then, the field-like thermal fuse detected and disconnected heat. It turned out that change of carbonization etc. was not looked at by the wallpaper on the background of the panel after an open circuit, either, but the thermal fuse functioned on it effectively.
[0025]
[Effect of the Invention] According to this invention, as explained in full detail above, even place [which does not require compressive force], it disconnects certainly according to an abnormality elevated temperature, and re-contact cannot be caused with the conductor moreover fused also after the open circuit, but the code-like thermal fuse which does not cause malfunction, and the field-like thermal fuse which has the same description can be obtained. These thermal fuses can take large current capacity, since it is moreover comparatively cheap, they can use it as a safety device of various heat devices, and improvement in reliability, the cutback effectiveness of cost, etc. are useful things.

[Translation done.]

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MEANS

[Means for Solving the Problem] The code-like thermal fuse by this invention is characterized by for processing processing of the above-mentioned conductor thin line to be carried out by flux in the code-like thermal fuse which serves as main material which consists of a conductor thin line fused at the predetermined temperature wound on the elastic heart which followed the longitudinal direction, and this elastic heart, and a space layer formed in right above [of it] from pre-insulation in order the above-mentioned object. Furthermore, the above-mentioned code-like thermal fuse is arranged on a flat surface at a meandering condition, and considering as a field-like thermal fuse using a means to fix this arrangement condition is also considered.
[0006] The elastic heart is the structure with which the spring material was covered around the main tensile strength object. As a tensile strength object, metal fibers, such as organic fiber, such as inorganic fibers, such as a glass fiber and an alumina fiber, a polyethylene terephthalate fiber, aromatic polyester fiber, an aliphatic series polyamide fiber, and aromatic polyamide fiber, and stainless steel fiber, are used. If it is a common elastomeric material as a spring material covered around these, it is good anything.
[0007] The cross-section configuration of the elastic heart is a cross-section configuration which has the desirable heights of plurality [direction / radiation], although especially a limit is not carried out. A configuration like a star type besides the usual polygon is also included in this. Moreover, although a star type and a polygon are configurations with the angle which generally clarified, they may be the configuration where the angle was crushed round here. These are desirable in order to go out promptly by the time of a conductor thin line tending to eat into the elastic heart compared with the case of a circular cross section, and a conductor thin line fusing. When it considers as a polygon as a cross-section configuration, six or less square shapes are preferably chosen from the interlocking easy of a conductor thin line.
[0008] The metal thin line chosen from the group which consists of low melting alloys and solder as a conductor thin line is used. As low melting alloys and solder, the melting point of the inside where the example is shown, for example in I-509 pages (******, the 3rd edition of revision, 1984 annual publications) of chemistry handbook basic volumes is a thing 300 degrees C or less. As a wire size of a conductor thin line, below 0.8mmphi extent is desirable by the common horizontal volume machine more than 0.04mmphi in which winding is possible to the elastic heart. Moreover, that in which processing processing was carried out by flux is used for this conductor thin line. Open-circuit time amount can be shortened compared with flux processing a non-processed thing. That to which what put flux into the center section of the conductor thin line carried out DIP processing of the conductor thin line front face by flux may be used for processing processing. The rosin resin system flux generally used is sufficient as flux, and the thing containing a little activator is sufficient as it. The above-mentioned conductor thin line is wound around an elastic body by the tension which is extent from which a conductor thin line does not shift at least, and it considers as main material. As a pitch around which a conductor thin line is wound, 1.5 or more times of a wire size are 15 or less twice [more than] as many times as this desirable still more preferably. Moreover, a winding ****** horizontal volume may be

performed for what draws and arranges how many of that conductor thin line, or was twisted.
[0009] When main material adjusts the cross section of the elastic heart, a horizontal wound strip affair, etc. and it is a configuration near a polygon, a space layer will be formed if an insulating layer is only extruded, without making it stick to concentric circular by the so-called technique of well-known tubing among these contractors. A space layer is formed by carrying out the braid of the fiber bundle to a non-dense as the other approaches. Preferably, it is adjusted so that spacing of the fiber bundle of this hand of cut may become 8 or less times of the width of face of this fiber bundle 0.5 or more times. Moreover, it is formed by carrying out the horizontal volume of the fiber bundle to a non-dense, and is formed by opening spacing with a times [5 or less times of the width of face of this fiber bundle] of 0.3 or more times, and carrying out the horizontal volume of the fiber bundle preferably. A **** braid or a horizontal volume means between fiber the braid or horizontal volume which left a certain amount of space here. a braid and a horizontal volume -- if larger [since the conductor thin line which the amount of space becomes less enough and fused is in the surroundings of a core when spacing of a fiber bundle is narrower than the minimum of the above-mentioned desirable range, there is risk of lifting re-contact about a chattering, and] than the above-mentioned upper limit which is not desirable, neither of the cases is desirable in order for pre-insulation material to enter in between and to lessen the amount of space on the contrary. Although the inorganic fiber or the organic fiber illustrated with the tensile strength object of the above-mentioned elastic heart is used as a class of fiber, desirable fire-resistant aromatic polyester fiber, aromatic polyamide fiber, polyphenylene sulfide fiber, a noncombustible glass fiber, an alumina fiber, etc. are used. of course -- a braid and a horizontal volume -- a duplex -- three-fold or more may be given.
[0010] In case pre-insulation covers pre-insulation, it is necessary to make it a conductor thin line not fuse it, although what is necessary is just to choose it as arbitration according to the ambient temperature for which a thermal fuse is used, or the melting temperature of a conductor thin line. As such pre-insulation, a bridge is constructed, and thermoplastic polymers, such as an ethylene system copolymer comparatively processible at low temperature, for example, are formed with the cross-linking method which can be done at low temperature, such as electron ray bridge formation and silane bridge formation, or it forms using the silicone rubber which can carry out extrusion near ordinary temperature and can construct a bridge at low temperature comparatively. Moreover, it is good also considering what carried out [****] of the braid with the insulating varnish as an insulating material. A braid may be given to sheathing in order to raise the mechanical strength of pre-insulation, when especially silicone rubber is used. Although the above is the example of the approach of carrying out pre-insulation continuously, when you may not be a long picture, it can also substitute only putting the insulating tube containing a contractile insulating tube for it. The thickness of pre-insulation increases [sensibility] and has the desirable direction which is thin meat, if need properties, such as electric insulation and a mechanical strength, are fulfilled.
[0011] These code-like thermal fuses are arranged in the meandering condition of arbitration, and a field-like thermal fuse can be manufactured using a means to fix this arrangement condition. Although the approach of sewing to a substrate or a base fabric, the approach of fixing using adhesives, etc. are mentioned as a means to fix, the means preferably mentioned to JP,62-44394,B or JP,62-62032,B is used. How to carry out thermal melting arrival to the metal plate or metallic foil which applied the approach of fixing in double-sided adhesion paper on a metallic foil, respectively and adhesives is described by these.
[0012]

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

EXAMPLE

[Example] This invention is not restricted by this example, although an example is shown below and the content of this invention is further explained to a detail.
[0014] <<example 1>> As an example 1, the code-like thermal fuse shown in drawing 1 was manufactured. Around tensile strength object 1a which comes to give silicone varnish treated to a glass cord with an outer diameter of about 1mm, the extrusion coat of the silicone rubber of a 1.4mmx1.4mm abbreviation square cross section was carried out as spring material 1b, and the elastic heart 1 as shown at drawing 2 was manufactured. The conductor thin line 2 which consists of an eutectic solder line (melting point of 183 degrees C) of 0.2mmphi was made to eat into the angle of this elastic heart 1 enough, and carried out 15 times / 10mm horizontal volume (one 3.3 times the pitch of a wire size) to it. The main material 3 which finished the horizontal volume deformed with interlocking, and had become a form near a circular cross section. Next, DIP spreading of the rosin resin system flux was carried out at the main material 3, and flux processing processing of the conductor thin line was carried out. Then, the braid of the fiber bundle which twisted no-alkali glass yarn of 9 micron of fiber ****, and was made into No. 70 [about] was carried out by the braid consistency 17 [about] / 25mm with the **** machine of 16 **, and the space layer 4 (braid layer) was formed. In this case, the width of face of a fiber bundle is about 0.5mm, and spacing of a fiber bundle is about 1mm (twice [about] of the width of face of a fiber bundle). It extruded at the last, carrying out water cooling of the silicone rubber with the thickness of 0.5mm as pre-insulation 5, and hot blast vulcanization was promptly given to it. On the occasion of hot blast vulcanization, temperature near the outlet of an air-heating furnace was made into 170 degrees C or less.
[0015] Thus, about 15cm of manufactured code-like thermal fuses was inserted in the glass fiber braid tube with a bore [of 4.0mm], and a die length of about 15cm, the external load was adjusted from 100V AC power supply, and time amount until it applies about 250-degree C hot blast to a part for a center section with a sink and a conductor thin line disconnects an about [0.1A] current was measured. For the external load, the condition of the ease of melting of this conductor thin line at the time of a conductor thin line being disconnected was investigated by the existence of a flash of an incandescent lamp using the incandescent lamp. This was repeated 5 times. Moreover, 500V insulation resistance tester was connected to the conductor thin line of the ends of the disconnected code-like thermal fuse, the open-circuit section was made crooked and the existence of the chattering of this open-circuit section, i.e., the existence of possibility of causing re-contact, and insulation resistance were investigated. The test result was shown in a table 1.
[0016] <<example 2>> As an example 2, the code-like thermal fuse was manufactured as follows. Around tensile strength object 1a which comes to give silicone varnish treated to a glass cord with an outer diameter of about 1mm, the extrusion coat of the silicone rubber of the radial star type cross section of 2.3mm of 1.5mm circumscribed circles of inscribed circles was carried out as spring material 1b, and the elastic heart 1 as shown at drawing 3 was manufactured. The conductor thin line 2 which consists of an eutectic solder line of 0.5mmphi was made to eat into the projection of this elastic heart 1 enough, and carried out 5 times / 10mm horizontal volume (one 4 times the pitch of a wire size) to it.

The main material 3 which finished the horizontal volume deformed with interlocking, and had become a form near a circular cross section. Next, DIP spreading of the rosin resin system flux was carried out at the main material 3, and flux processing processing of the conductor thin line was carried out. The space layer 4 and pre-insulation 5 were manufactured like the example 1. Except having set the current value to 0.5A, it examined like the example 1 and the result was written together to a table 1.

[0017] <<example 3>> The code-like thermal fuse was manufactured like the example 2 except having used the eutectic solder line of 0.5mmphi which put flux into the center section as a conductor thin line as an example 3. In addition, DIP spreading of the flux to main material was not performed. The same trial as an example 2 was performed, and the result was written together to a table 1.

[0018] <<example 4>> As an example 4, the code-like thermal fuse was manufactured like the example 2 except having used the eutectic solder line of 0.6mmphi as a conductor thin line. In addition, the horizontal volume pitch of a conductor thin line will be 3.3 times the wire size. The same trial as an example 2 was performed, and the result was written together to a table 1.

[0019] <<example 5>> The code-like thermal fuse was manufactured like the example 2 except having used the eutectic solder line of 0.6mmphi which put flux into the center section as a conductor thin line as an example 5. The horizontal volume pitch of a conductor thin line is 3.3 times the wire size. In addition, DIP spreading of the flux to main material was not performed. The same trial as an example 2 was performed, and the result was written together to a table 1.

[0020] Example of <<comparison>> As an example of a comparison, the code-like thermal fuse was manufactured like the example 2 except not carrying out flux processing processing to the main material after carrying out the horizontal volume of the conductor thin line. The same trial as an example 2 was performed, and the result was written together to a table 1.

[0021]

[A table 1]

	実施例1	実施例2	実施例3	実施例4	実施例5	比較例
導電体細線（半田線）の線径 (mm)	0．2	0．5	0．5	0．6	0．6	0．6
フラックス処理加工の有無	有	有	有	有	有	無
平均断線時間 (秒)	38	61	58	67	64	90
断線時間のバラツキ (秒)	10	12	11	13	12	45
白熱電球の点滅の有無	無	無	無	無	無	1本有
再接触の有無	無	無	無	無	無	無
断線後の絶縁抵抗 (MΩ)	10以上	10以上	10以上	10以上	10以上	10以上

[0022] If the test result of a table 1 is seen, both the code-like thermal fuses of this example have the small variation in average open-circuit time amount and open-circuit time amount compared with the example of a comparison, and it is good, and it has disconnected thoroughly at once, without the condition at the time of a conductor thin line being disconnected also causing the flash of an incandescent lamp, and the effectiveness of flux processing processing is proved.

[0023] <<example 6>> As an example 6, the code-like thermal fuse manufactured in the example 2 was arranged in the meandering condition, and the field-like thermal fuse as shown in drawing 4 was manufactured by the approach shown in JP,62-44394,B. The sign 8 in drawing is a double-sided gummed paper which has mold-releasing paper 9 on one side, and a sign 6 is the code-like thermal fuse

arranged in the top face of said double-sided gummed paper 8 by the meandering condition. Furthermore, a sign 7 is a wrap metallic foil about said whole code-like thermal fuse 6, and adhesion immobilization of this metallic foil 7 is carried out with said double-sided gummed paper 8. In this example, aluminium foil with a thickness of 100 micrometers was used as a metallic foil, using an acrylic gummed paper as a double-sided gummed paper. Although the metallic foil and the double-sided gummed paper were used in this example since it carried out according to JP,62-44394,B, you may manufacture by the approach according to this official report, and a plastic film may be used instead of other ingredients, for example, a metallic foil, in the manufacture approach of this official report.
[0024] Thus, the manufactured field-like thermal fuse was stuck on the iron panel with a thickness of 0.5mm, and the panel was stood vertically. Commercial wallpaper was stuck on the background of a panel. This condition was maintained until it brought close to a field-like thermal fuse to extent which the outer flame of a burner touches with the current of 0.5A with a sink and the conductor thin line of a thermal fuse was disconnected in this condition. Then, the field-like thermal fuse detected and disconnected heat. It turned out that change of carbonization etc. was not looked at by the wallpaper on the background of the panel after an open circuit, either, but the thermal fuse functioned on it effectively.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] some code-like thermal fuses which manufactured as an example 1 of this invention -- it is a notching side elevation.
[Drawing 2] It is the sectional view of the elastic heart in the code-like thermal fuse manufactured as an example 1 of this invention.
[Drawing 3] It is the sectional view of the elastic heart in the code-like thermal fuse manufactured as an example 2 of this invention.
[Drawing 4] some field-like thermal fuses which manufactured as an example 6 of this invention -- it is a notching perspective view.
[Drawing 5] the assembly condition of the thermal fuse of the conventional example is shown -- it is a notching perspective view a part.
[Description of Notations]
1 Elastic Heart
1a Tensile strength object (elastic heart tensile strength object)
1b Spring material
2 Conductor Thin Line
3 Main Material
4 Space Layer (Braid Layer)
5 Pre-insulation
6 Code-like Thermal Fuse
7 Metallic Foil
8 Double-sided Gummed Paper
9 Mold-releasing Paper
10 Thermal Fuse
11 Connection Child
12 Lead Wire
13 Protective Tubing

[Translation done.]